



## 2nd AIR SCADRON STRATEGY INCREASING SUPPORT OF AIR DEFENSE OPERATIONS THROUGH WEATHER MODIFICATION TECHNOLOGY

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**A b s t r a c t** - The involvement of the Indonesian Air Force in Weather Modification Technology Operations is part of Military Operations Other than War. Along with the rapid development of technology in the field of Weather Modification which makes the use of this technology easier. One of the benefits of Operation Weather Modification Technology is to support Air Defense Operations. However, in several implementations there are several obstacles encountered, the Air Squadron is not yet equipped with a sophisticated weather radar. Today's weather radar requires a technology upgrade. The 2nd Air Squadron had problems carrying out TMC Operations at night. In order for the use of Weather Modification Technology to be used optimally for military operations and able to support air defense operations, an effective and efficient strategy is needed. The purpose of this study is to analyze the main obstacles, the implementation of Air Defense Operations, possible air threats and strategies to increase support for air defense operations through the use of Weather Modification Technology by the Air Squadron 2. The research method used is a qualitative case study design. Theories used include strategy, air power, weather manipulation and air defense operations. The results of this study are the main obstacles encountered related to the use of Air Squadron TMC are weather conditions, lack of raw materials and inadequate equipment. The conditions for the implementation of air defense operations are not optimal and there are several threats that can arise in the Indonesian air sovereignty area. The strategy used to achieve the goal is to overcome existing obstacles and improve the ability of the Air Squadron 2 through existing instruments. The conclusion of this study is that threats to air sovereignty can be anticipated by optimizing the Air Squadron 2's weather modification capabilities.

**Keywords :** 2nd Air Squadron Ability, Air Defense Operations, Utilization, Strategy, Weather Modification Technology

## 1. Introduction

Army (TNI) as tool appropriate national defense with Task The subject of the TNI is demanded for play a role active in keep and maintain Indonesia 's sovereignty includes airspace sovereignty \_ national as well as protect whole citizen . Airspace control \_ national absolute required for continuity life nation and state. one \_ current problem \_ is overall FIR (Flight Information Region) not yet fully under \_ \_ control Government Republic of Indonesia. FIR region not yet is at under control Government The Republic of Indonesia is the FIR of the Batam and Island regions Natuna . For could maintain control of airspace national the so need existence Operation Implemented Air Defense by Keep going continuously , both in times of peace as well as in times of war . Operation Air Defense in essence is activities as effort maintain airspace sovereignty \_ national to every threat through air . Activities it 's basically conducted by integrated involving \_ elements of the TNI and civilian who has ability defense air ( Hanud ). form threat intermittent air \_ could appear require Hanud this held by Keep going continuously so that every possibility threat air could detected as early as possible ( Anggiat & Hadiati , 2001).

Based on Protap Kohanudnas year 2017 explained that operation defense air consist from two component that is element defense air active and element defense air passive . Strength air active consist elements of the Indonesian Air Force in the form of a defense radar air on the ground and in airplanes , planes combat ambush , plane cracker for low speed low attitude (PLSLA), anti drone , bullets control ( missile ) and cannon defense Air Force , Military Civil Coordination ( MCC ) , Air Base ( Air Base ) . From the elements of the Army ( TNI AD) in the form of : bullet control and cannon defense air as well as existing regional command object national vitals . From elements of the Indonesian Navy ( TNI AL) components air active could in the form of Boat Republic of Indonesia (KRI) which has ability defense air . For element defense air passive consist from the airport Civilian , Police Republic of Indonesia, component spares and components supporters . Operation defense air

will done with good and successful , if whole component active and passive equipped and supported with adequate facilities and defense equipment .

Obstacles in the field is conditions on some facilities and defense equipment not yet sufficient , so need conducted addition amount facilities and defense equipment that will operated , as well as To do update to defense equipment facilities that are in good condition has inedible age and technology has left behind era . For resolve constraint in implementation operation defense air need conducted optimization utilization ability from various unit or agency good military nor civilian , one of them is utilise ability Technology Modification Weather from various unity especially in the Air Force. Engage Indonesian Air Force institutions in Operation Technology Modification Weather is one \_ Operation Military Besides war . along with development increasingly technology \_ fast in field Modification Weather that makes utilization technology this the more easy . There is many benefit Technology Modification Weather in support implementation operation military . one \_ benefit from Operation Technology Modification Weather is for support Operation Air Defense . In support Operation Modified Air Defense weather could used for produce heavy rain events in enemy territory aimed hinder movement enemy , thwart the take-off of enemy aircraft , obstruct the order of the aircraft enemy no could landing at the base air own , create weather bad which one is related with operation defense air so that aircraft enemy no could enter sovereign territory \_ air national which has an impact on the inhibition of movement aircraft combat enemy including aircraft combat generation the fifth who has stealth technology ( stealth ) or no could detected by radar) so that constraint related to radar can overcome , the process of dropping troop and delivery process logistics delivered \_ through track air (Dennis, 1984).

Heavy rainy weather could result in flood big later \_ bring impact damage to facilities building military owned by opponent and side enemy no could utilise optimally their facilities \_ \_ have . Manipulation the weather can also used for

support attack air with clean clouds that can endanger flight plane . Manipulation weather like this has conducted in Technology Modification Weather To use prevent disaster flood in DKI Jakarta Province . Utilization technology modification weather for operation military war has could carried out by the Indonesian National Army . This thing could seen at level success results Operation Technology Modification Weather ( TMC ) carried out by units under Air Force Command . In history military use disaster natural artificial for operation war has used several times including the war China-Japan Second in Incident The Yellow River Flood of 1938 resulted from from sabotage Troops Chinese nationalists aiming dispel movement troops Japan and Events Flood Great Bandung 1945 which is results sabotage from Dutch and British troops aiming give impact loss to Warrior Indonesian independence in defend the Bandung area and its surroundings (Krauss, 1999).

one \_ units involved \_ in the Operations program Technology Modification Weather (TMC) is 2nd Air Squadron operating aircraft type CN-295. Experience in implementation Operation Technology Modification Weather and rate success Air Squadron 2's TMC results are sufficient high . This thing could seen from results in several times involved Air Squadron 2 in Operation Technology Modification Weather of them blackout fire forests and land on the islands of Sumatra and Kalimantan, as well as countermeasures flood DKI Jakarta Province . For support implementation Operation Technology Modification Weather in Operation Military War , a The Air Squadron must capable doing TMC operation every time , has a sophisticated weather radar , the aircraft used could capable infiltrate into enemy territory , the aircraft used have capacity for transport materials needed \_ in manipulation weather , readiness and ability personnel in doing Operation Technology Modification Weather ( Kodoatie & Sjarief , 2006).

However in a number of implementation there is a number of the obstacles encountered , the Air Squadron has not yet be equipped with advanced weather radar . \_ Current weather radar \_ \_ \_ need a technology upgrade . Air Squadron 2 is

having constraint in doing TMC operation at night day . In order to use Technology Modification Weather could used optimally for \_ operation military and capable support operation defense air required an effective and efficient strategy . Developed strategy later capable resolve the current obstacles and facing \_ \_ challenges that will faced in the future . In study this used method that is qualitative . Method qualitative this capable give description related with the strategy used (Miles, 2014).

## **2. Literature Review**

### **2.1 Strategy Theory**

Definition of strategy according to a number of dictionary among others are : According to Webster 's dictionary (1969) strategy is Science and art hiring strength political , economic , psychological , and military something nation or country group for give Support maximum to adopted policy \_ in peace or war . Furthermore , the strategy is Knowledge or art planning and directing movement and operation military large (Random House, 1982). Besides that , the strategy is Science and art command military applied to the whole planning and implementation operation combat scale big . (American Heritage, 1982).

The *Air Strategy* air ) defined by Giulio Douhet is general recognized as the first advancing air strategy in what he called " command air ". " For conquer order air means victory ; beaten in the air means beat and accept condition whatever is possible want to enforced enemy ". For ensure defense adequate , necessary and sufficient national \_ for is at in position in Thing war for conquer command air . Order air no could conquered except by power adequate air . \_ Defense national only could guaranteed by strength air independent from adequate strength . \_ The same elements this could found in modern conception of air strategy or theory in three premise ( assumptions that are considered true ) mutually related : Strength air could Becomes instrument deceptive war ; \_ Use deceptive instrument \_ need superiority air ; Reach superiority air need control center strength air . (Carl H. Builder, 1980).

## 2.2 Draft Manipulation Weather

3D cloud model \_ depends time (3-D time dependent), has people make and run , and the results show that that manipulating this process could initiate , start , speed up , and add rainfall . However \_ so applied in the field , a lot obstacles encountered . \_ Size , quantity ingredient introduced seedlings , and locations as well as right time on the right cloud \_ is key success in manipulation of this process . Dominant rain in the cloud hot is Collission -Coalescence as stated by Cotton and Pielke ( in Cotton, 1998). This process is especially effective on cloud bases warm with properties of air mass maritime or have lots of Liquid Water Content (LWC). one \_ method seeding for increase rainfall is \_ with enter particle hygroscopic which can quick Becomes liquid through the process of depositing water vapor in the environment saturated air . \_ Cotton (1998, p.15) states that method conventional conducted with release salt particles measuring 5 - 10 microns (diameter) below base cloud . Through the steam deposit process water, salt particles expand fast until reach a diameter of 25 - 30 microns or more big . Salt particle size as big as this Act as a large nucleus , and its presence in the vicinity of cloud droplets on clouds or part clouds that haven't rained yet, are embryo merging and or participate in the formation of rain through the process of collission-coalescence . Next based on observation and study of the model obtained results that in some cloud certain , addition ingredient hygroscopic could enlarge spectrum of cloud drops and accelerate the process of rain (Cotton, 1998). Besides that manipulation of this process can also be extend duration of rain from occurring by naturally , through enhancement rain process efficiency . Effects and information about introduction ingredient hygroscopic has also been many published . There is problems with implementation method conventional use ingredient seedling hygroscopic . Material preparation , handling , being constraint because nature ingredient hygroscopic .

## 3. Method Study

Study this use method study qualitative with design study descriptive . Method research basically \_ is method scientific for get data with purpose and use certain . ( Sugiyono , 2018). Study qualitative is a research used \_ with destination for obtain data-rich, in- depth information about issue or problem that will solved . (Nasir, 2011). Study qualitative will conducted if in a number of condition like , if problem study not yet clear , purposeful for understand meaning behind the visible data , for understand interaction social , for understand people 's feelings , want develop theory , for ensure data truth , want To do study history development . ( Sugiyono , 2018).

Method descriptive is one method in researching group status human , a subject , a set of conditions , a system thinking or class \_ events in the present . Destination from study descriptive this is make description , overview or Paint by systematic as well as connection between phenomenon under investigation (Nazir, 2011). In study this method descriptive could help researcher in describe how utilization Technology Modification Weather Air Squadron 2 for support Operation Air Defense and how the relationship between existing variables . \_ Likewise how \_ find influencing factors and emerging obstacles \_ \_ could depicted or described (Ramli, 2010).

Subject target research \_ for investigated by researchers . If we talk about subject research, actually our talk about the unit of analysis , namely the subject to be center attention or target researcher . In study this , respondent is the person requested give description about something fact or opinion . ( Arikunto , 2006). Subject in study this is officers in the Indonesian Air Force who have authority in implementation Operation Modification Weather and personnel The 2nd Air Squadron on duty at Halim Perdanakusuma Air Base which is still active and have experience in Operation Technology Modification Weather

#### **4. Results and Discussion**



#### **4.1 Potential Threats to Air Defense Operations**

Along with the dynamics and developments of geopolitical and technological conditions also increase the potential threat to Air Defense Operations. From the results of the study, it was found that the current air threat to national territorial sovereignty is in the form of violations committed by military and civilian aircraft that have the potential to pose a threat to national air sovereignty. Threats such as unlicensed flights passing through the airspace of the Republic of Indonesia have the potential to carry out activities such as espionage or reconnaissance operations.

The current condition of the Indonesian Air Force's ability to deal with threats to national sovereignty is still in an inadequate condition. Based on the theory there are several types of abilities, namely physical and intellectual abilities. Physical abilities, in this case, are related to skills, abilities and strengths. Physical capabilities in dealing with threats to sovereignty can be in the form of personnel capabilities in intercepting or dispelling aircraft that violate Indonesian airspace. While intellectual ability is the ability to think and reason to obtain problem solving. This intellectual ability is the ability to develop strategic plans to deal with existing threats. In general, the capabilities of the Indonesian Air Force in tackling threats that may arise are as follows:

- a. Improve the detection capability of radar and blank spot areas as well as improve the defense system's ability to deal with sudden threats. This ability includes technical abilities which are related to knowledge and mastery of activities related to processes and procedures related to work and work tools. Technical ability is meant by someone in an organization or institution must be able to master the existing or assigned work methods. This means that an individual who has technical capabilities which include work procedures, work methods and existing tools as has been assessed can increase employee productivity so that it is more leverage.



- b. Increasing efforts to cover the entire National Airspace with the PSR/SSR Radar as well as the bureaucracy for deploying fighter aircraft as executor. This ability includes the conceptual ability, the ability to see a rough picture to recognize the important elements in a situation, understand between these elements. conceptual ability is the ability for an employee if he is a (decision maker) or decision maker in analyzing and formulating the tasks he carries out. With this ability, the work can run well because it can choose which work priorities should take precedence.
- c. Increasing the ability of Force Protection which is a term used by world military organizations in describing preventive measures taken with the aim of protecting their own strength from the dangers of enemy attacks, reducing the risks that occur due to enemy actions in certain areas both in peacetime and wartime, some examples that must receive security include; personnel resources, defense equipment, headquarters and facilities, as well as information security. This ability is a human ability which is the ability to work in a group atmosphere where the organization feels safe and free to raise problems. The ability to be human is the ability possessed by employees at work, it can be a work group or work team, namely working together with fellow work members. This is very important because the ability to communicate can issue good ideas, opinions even in receiving opinions and suggestions from others can be a success factor in carrying out a good task. So the ability possessed by individuals in working with work groups or work teams in an institution as described above is important to achieve maximum work productivity.

Potential threats that can arise have an impact on the conditions of the air defense operations carried out. Air Defense Operations are carried out with the aim of anticipating potential threats that exist and may arise in the future (Builder, 1989).

#### **4.2 Current Implementation of Air Defense Operations**

From the TNI Swa Bhawana Pakca (SBP) Air Force Doctrine in 2019. The form of Air Operations in War Military Operations (OMP) consists of:

- a. Intelligence, Surveillance, and Reconnaissance Air Operations (OUIPP) Air Operations. OUIPP is a business, work, activity and action (UPKT) carried out to obtain information in the air sector which is processed into intelligence products for decision making, including three sub-operations, namely air intelligence operations (air intelligence operations), air observation operations. /ops matud (air surveillance operations), air reconnaissance operations/ops intud (air reconnaissance operations).
- b. Strategic Attack Air Operations (OUSS). OUSS aims to attack and destroy strategically valuable targets which are the center of gravity in order to neutralize capabilities and cancel the enemy's desire to fight.
- c. Counter Air Operations/OULU (Counter Air Operations). OULU is carried out in two types of sub-operations, namely Offensive Counter Air Operations (OULUO), and Defensive Counter Air Operations (OULUD) to destroy or neutralize enemy air forces on the surface and in the air in order to obtain air superiority in the operational field, so that ground, sea and friendly air operations can be carried out without interference and threats from enemy air power.
- d. Counter Land Operations (OULD). OULD is an operation to destroy enemy/opponent land forces so that friendly troops' ground operations can achieve the successful implementation of tasks. This operation

includes four sub-operations, namely Air Protection Operations/Ops Lindud (Air Cover), Air Interdiction Operations/Air Interdiction, Air Fire Assistance Operations/OBTU (Close Air Support), and Direct Air Attack Operations/OSUL (Air Operations). strikes).

- e. Counter Sea Operations (OULL). OULL is an operation to destroy enemy/opponent naval forces so that friendly sea operations can achieve the successful execution of tasks. This operation includes five sub operations, namely Operation Air Protection/Ops Lindud (Air Cover), Operation Air Insulation/Ops Sekatud (Air Interdiction), Operation Air Fire Assistance/OBTU (Close Air Support), Operations Direct Air Strike/OSUL (Air Strike ), and Submarine Attack Operations (OLBP).
- f. Air Mobility Operations (OMU). OMU is an air operation to move personnel and or goods by landing, dropping or transferring between aircraft in the air. OMU consists of three sub-operations, namely air transport operations/angud ops (air lift operations), air medical evacuation operations/OEMU (aero medical evacuation operations), and air refueling operations/OPBBU (air refueling operations).
- g. Special Air Operations / OUK (Special Air Operations). OUK is an air operation to achieve specific objectives with specialized personnel, techniques, tactics, organization, equipment, equipment, training and education in order to facilitate Air operations. The OUK consists of nine sub-operations namely Special Operations/OPSSUS (special operations), Combat Sar Operations/OPSSARPUR (Combat Sar Operations), Air Base Operations Seizure and Operations/OP3U (Attack and Operate Air Base Operations), Air Force Drop and Destruction Operations /OPPKU (Air Borne Raid Operations), Air Base Operations/OPPU (Airbase Operate Operations), Air Power Protection



Operations (Force Protection Operations), Air Base Reconstruction Operations/ORPU (Airbase Reconstruction Operations), Disaster Management Front Control Operations (OPDPB ), and OPK (Urban Warfare Operations), Counter Terrorism Operations (OPSGULTOR) (Counter Terrorism Operations).

- h. Air Law Enforcement Operations (OKPHU). OKPHU is any business, work, or activity aimed at enforcing the law and maintaining air security in accordance with laws and regulations to ensure the creation of airspace conditions and air bases that are safe and free from threats of violence, threats of navigation, violations of law in the airspace, including is a violation in the restricted airspace and restricted airspace, the Air Defense Identification Zone (ADIZ), a violation of the air space above the Indonesian archipelagic sea lanes (ALKI), as well as certain areas in the form of shared airports, bases shared airspace and airports or air bases in border areas and areas with potential threats.
- i. Air Defense Territory Empowerment Operations (Air Defense Territory Empowerment Operations). Opsdawilhanud is an operation to help the government prepare national potential to become an air defense force that is prepared early including the development of aspects of geography, demography, and social conditions of the air defense area (airports, airlines, defense industry and vital objects related to the air dimension) and their supporting forces in order to implement the OMP, the implementation of which is based on the interests of national defense in accordance with the universal defense system. Opsdawilhanud consists of 3 sub-operations, namely operations for fostering regional resilience (ops bintangwil), social communication operations (ops komsos), and service operations (ops bakti).

- j. Information Operations/OI (Information Operations). OI is an air operation whose implementation combines various intelligence capabilities, information technology, communication and electronics, psychology, infolahta and information. In order to obtain optimal results, it must be guided by the main points of information operations which include objectives, goals, principles, limitations and functions as well as the forms of operations. Information operations consist of two sub-operations, namely offensive counter-information operations (OLIO) and defensive counter-information operations (OLID).

The current conditions of the implementation of Air Defense Operations from the results of the research are summarized as follows:

- a. There is a bureaucratic system that is still difficult and takes a long time to move fighter aircraft in interception of aircraft that commit violations. A difficult bureaucratic system reduces efficiency in terms of time when taking action. This condition is not good in the implementation of air defense operations because each action will take a long time so that it will provide an opportunity for aircraft that commit violations to rush out of the airspace of the Republic of Indonesia. The long span of time in the implementation of the bureaucratic system has an impact on the readiness to take action against violations that occur in the air sovereignty of the Republic of Indonesia.
- b. Air defense is still constrained by ceremonial activities which often involve all aircraft owned by the Indonesian Air Force so that it becomes the vulnerability of air defense at that time. When ceremonial activities occur, the air power that is on standby will decrease. This of course can be used by opponents or enemies who intend to attack air defense areas in Indonesia. The condition of minimal and inadequate



strength will have an impact on the non-optimal results achieved in the implementation of Air Defense Operations. The Indonesian Air Force's current air power fleet is still not sufficient for the implementation of an ideal Air Defense Operation. The lack of armaments has an impact on the technical capabilities possessed. Technical ability is knowledge and mastery of activities related to processes and procedures related to work and work tools. Technical ability is meant by someone in an organization or institution must be able to master the existing or assigned work methods. This means that an individual who has technical capabilities which include work procedures, work methods and existing tools as has been assessed can increase employee work productivity so that it is more leverage. (Moenir, 2008)

- c. Air defense operations are currently not optimal and not efficient because interoperability has not been able to run optimally. The modernization of defense equipment must continue to be developed with a minimum capability that is able to balance the defense and threats that will occur, especially in the regional area. In addition to the adequate number of defense equipment needed to support the implementation of Air Defense Operations, the technology owned must be sophisticated that it adapts to the times. Modernization of equipment is also needed to replace equipment or defense equipment that has decreased capabilities caused by age or age. Modernization is also needed to match the strength of the opponent.
- d. Kohanudnas can properly integrate the defense equipment owned by the radar units under it and integrate it with the airport SSR Radar in the airspace border area. The Radar system is a system that detects aircraft crossing the air sovereignty area of the Republic of Indonesia. Without a sophisticated and integrated Radar system that covers all

areas, efforts to detect existing threats will not be detected early. The implementation of Air Defense Operations is constrained by the availability of Radar which supports it in knowing the movement of aircraft crossing the Indonesian air sovereignty area.

- e. Repair and revive war equipment that is not operational due to limited or unavailability of spare parts. Repair and maintenance of equipment and defense equipment is very important, it is related to the ability of the defense equipment used to be optimal. Equipment repair is also related to in-flight safety and operations. Safety is the main thing in every operation. Security guarantees for the use of existing equipment or defense equipment will affect the psychology of TNI members who are carrying out operations.

The condition of the implementation of air defense operations is currently experiencing various obstacles. From the results of this study, it can be seen that there are various obstacles that influence the non-optimal implementation of Air Defense Operations. This condition has an impact on increasing threats to the sovereignty of Indonesia's airspace. Violations that can appear are as follows:

- a. All other State aircraft that violate the National Airspace without using a Transponder in the National Airspace area which is not covered by the PSR Radar with bad intentions. This has an impact on the undetected movement of aircraft entering the airspace of the Republic of Indonesia, whether legal or illegal, of course endangering the air sovereignty of the Republic of Indonesia and can threaten the safety of national aviation.
- b. Violations of airspace committed by civil or military aviation that are carried out intentionally or unintentionally. This violation violates the laws or regulations in force in Indonesia. Violation of airspace is a form of violation of the air sovereignty of the Republic of Indonesia. Legally,



this violation must be dealt with in order to uphold the air sovereignty of the Republic of Indonesia.

- c. Pre-Emptive Strike. A military attack launched suddenly against an enemy force that poses a threat to the territorial integrity and sovereignty of the country. Before the enemy attacks, this preventive attack is very effective in destroying the will to fight for the opponent. This attack can inflict damage on strategic points without optimal countermeasures. To prevent this, it is necessary to have an operation that acts as an effort to prevent the desire and as an effort to show the air power it has so that it has an impact on the opponent's desire to carry out attacks. Efforts made must be able to run optimally in order to effectively achieve the objectives to be achieved, namely preventing sudden attacks on strategic points of national defense.

With these various obstacles, it can be concluded that the current implementation of air defense operations is not yet in optimal condition so that it requires some support to achieve these conditions. With various potential threats to air defense operations that may arise in the future. Support needs to be increased, one of which is through the use of weather modification technology owned by Air Squadron 2.

#### **4.3 Strategy to Increase Support for Air Defense Operations Through Utilization of Weather Modification Technology by the Air-2 Squadron.**

Air Squadron 2 requires support to overcome constraints and optimize the implementation of Weather Modification Technology Operations. The support needed is support for the implementation of Weather Modification Technology Operations at night which currently cannot be implemented in terms of safety and operation. This support is to improve the capabilities of the Air Squadron 2.

Capability is defined as a person's basis in carrying out work effectively or very successfully. Ability means the capacity of an individual to perform various tasks in a job. The support provided can improve the ability of Air Squadron 2 so that the implementation of Weather Modification Technology Operations can be optimal. Air Squadron personnel need safety support in carrying out operations. Good safety will have an impact on the mental focus and thoughts of Air Squadron 2 personnel in Operations which will improve intellectual abilities which are the abilities needed to carry out various mental activities (thinking, reasoning and solving problems).

In carrying out their duties, Air Squadron personnel face several obstacles in carrying out Weather Modification Technology Operations. These constraints are:

- a. Weather factors have changed significantly so that the predictions made during the pre-flight briefing sometimes still differ from actual conditions or during flight, making the TMC mission less efficient.
- b. Lack of raw materials and equipment used. The amount of raw materials that are not available in accordance with the needs and the lack of a number of equipment owned will certainly affect the implementation of operations. Insufficient raw materials cause TMC operations to not provide optimal results.
- c. The obstacles that have been experienced are leaks in the TMC console, and the length of time it takes to load salt because the console that is owned per aircraft is only one unit. This condition causes only one aircraft to be involved in Operation TMC. This has an impact on the time it takes to complete an operation.
- d. Implementation of tube installation in accordance with existing procedures. Installation of equipment that is not in accordance with the procedure will result in damage and reduced usage time, thus requiring more intense equipment maintenance. Of course this will cause new problems in the implementation of TMC Operations.

These constraints affect the ability of personnel in carrying out their duties. Some of the types of abilities include:

- a. Technical Skills (Technical Skills) are knowledge and mastery of activities related to processes and procedures concerning work and work tools. Technical ability is meant by someone in an organization or institution must be able to master the existing or assigned work methods. This means that an individual who has technical capabilities which include work procedures, work methods and existing tools as has been assessed can increase employee work productivity so that it is more leverage. Obstacles that occur during the implementation of TMC Operations affect technical capabilities. Lack of a number of equipment causes the work method to be carried out cannot be carried out and implemented optimally.
- b. Human skills are the ability to work in a group atmosphere where the organization feels safe and free to raise concerns. The ability to be human is the ability possessed by employees at work, it can be a work group or work team, namely working together with fellow work members. This is very important because the ability to communicate can issue good ideas, opinions even in receiving opinions and suggestions from others can be a success factor in carrying out a good task. So the ability possessed by individuals in working with work groups or work teams in an institution as described above is important to achieve maximum work productivity. With the obstacles encountered during the implementation of TMC Operations. Human capabilities are not accommodated adequately. This will have an impact on performance that is not optimal or optimal.
- c. Conceptual skills are the ability to see a rough picture to recognize the important elements in a situation of understanding between those elements. conceptual ability is the ability for an employee if he is a (decision maker) or decision maker in analyzing and formulating the tasks

he carries out. With this ability, the work can run well because it can choose which work priorities should take precedence. With conditions there are obstacles that affect the implementation of operations. The personnel involved are confused about implementing existing capabilities, including conceptual skills. Problems that arise hinder support for personnel to implement capabilities to the fullest. Choosing work priorities will cause violations of existing procedures. In the implementation of TMC Operations there are stages that must be passed.

So that personnel in carrying out Weather Modification Technology Operations without experiencing obstacles, several efforts need to be made, including:

- a. Each CN-295 aircraft has a spare console that can or function as a backup or be used entirely alternately in order to speed up the loading process. By overcoming problems related to the number of consoles used in the implementation of TMC Operations, the time required so far which is considered long can be trimmed so as to shorten the implementation time. The short time used to carry out TMC Operations will affect the results of operations.
- b. So that the aircraft is equipped with a more accurate weather radar regarding the characteristics of the clouds equipped with a consul so that the weather monitoring is continuous before, during and at the end of operations. The weather radar used on the aircraft makes it easier for Air Squadron 2 pilots to determine the direction of the aircraft towards the cloud that is the target for seeding.
- c. Downlink and Uplink systems need to be established so that the transfer of information from the air to the ground and vice versa can be established during the implementation of Weather Modification Technology. Transfer of information is very important to smooth the execution of an operation.

The information collected is processed and then later will be used as input and consideration in determining decisions related to the Operations being carried out.

- d. Increase the stock of salt and equip equipment so that the amount can be sufficient to support the implementation of Weather Modification Technology Operations. With the fulfillment of the need for raw materials and equipment has an impact on the optimal results achieved in the implementation of TMC Operations.

Efforts to overcome these obstacles will affect the ability of Air Squadron 2 to carry out Weather Modification Technology Operations. Ability is an individual's capacity to perform various tasks in a job. All abilities of an individual are essentially composed of two sets of factors, namely intellectual abilities and physical abilities (Robbin, 1999). Intellectual ability is the ability needed to carry out mental activities. While physical ability is the ability needed to carry out tasks that require stamina, dexterity, strength and similar skills. The five dimensions of intellectual ability are as follows:

- a. Numerical intelligence (Ability to calculate quickly and precisely). TMC operation is an operation that requires precise calculations so that it requires numerical intelligence of the personnel involved.
- b. Verbal comprehension (The ability to understand what is read or heard and the relationship of words to one another). TMC operations involve several personnel from several agencies or institutions. So that the verbal understanding of the personnel involved is very necessary during the implementation of TMC Operations.
- c. Inductive reasoning (The ability to recognize a logical sequence in a problem and then solve the problem). Inductive reasoning in the implementation of TMC Operations is needed when there are obstacles. Problems and obstacles that arise must be addressed immediately.

- d. Deductive reasoning (Ability to apply logic and judge the implications of an argument). Deductive reasoning is the ability to make a logical assessment of an argument. TMC operations require the ability of deductive reasoning from each personnel to translate and implement any given orders.
- e. Memory (The ability to hold and recall past experiences). Every personnel who has carried out TMC Operations more than once can remember the experiences of TMC Operations that have been carried out previously. Previous experience can be a reference to avoid the occurrence of obstacles or problems and errors in the implementation of the next operation. Previous experience can also make the implementation of the next operation increase.

There are five indicators for capacity building, namely:

- a. *Knowledge* (knowledge).

Knowledge is the foundation on which will build abilities. In Weather Modification Technology Operations knowledge of the science of weather and the selection of clouds that are the target of weather modification.

- b. Training ( *training*).

Training is one way to hone the ability of a person or individual. The training process uses a systematic and organized procedure. Air Squadron 2 conducts Weather Modification Technology Operations exercises on a regular basis so that at the time of implementation Air Squadron 2 is in a state of readiness and implements everything obtained during the training.

- c. experience \_

The level of a person's ability can also be seen from his experience. The more experience a person has, the ability of a person is also better than those who are not experienced. Weather Modification Technology Operations have been implemented several times. The greater the number

of implementations of the operating frequency, the more experience the personnel will have. The amount of experience possessed by personnel is directly proportional to the increase in personnel capabilities.

d. Skills ( *skills*)

A person's ability to master a tool or do a given task. In the implementation of weather modification technology operations, the equipment used is equipment with the latest technology. Mastery in equipment operations determines the successful implementation of Weather Modification Technology Operations. The ability to master the equipment can also affect the maintenance of safety during the operation.

e. Ability

The condition in which an individual is able to complete a given task. A TNI personnel must be able to carry out every mission and operation carried out. 2nd Air Squadron Personnel shall have the capability to carry out Weather Modification Technology Operations. After optimizing and upgrading Air Squadron 2's capabilities regarding Weather Modification Technology Operations. This capability can be leveraged to increase support for Air Defense Operations. The current state of Air Defense Operations requires various supports. In order to optimally utilize Weather Modification Technology Operations capabilities to increase support for Air Defense Operations, a strategy needs to be designed which can provide optimal influence and impact.

According to Petit Larrousse (2006), strategy is the art of coordinating the actions of military, political, economic and moral forces that are implied to be involved in war behavior or the preparation of the defense of a nation or coalition. Or, in another, "the art of coordinating actions, agile maneuvers to achieve a goal. The equation is: *STRATEGY equals ENDS* (goals to be achieved) plus *WAYS* (actions)



plus *MEANS* (instruments by which multiple *ENDs* can be achieved). This general concept can be used as the basis for the formulation of any type of strategy: military, political, economic, etc., depending on the element of national power used. Given the potential threats that exist to national air sovereignty, it is necessary to develop support for an air defense operation. One of the supports that can be provided is through the utilization of the capabilities of Air Squadron 2 in terms of Weather Modification Technology Operations. In order for the capability to be utilized optimally, it is necessary to develop a strategy for utilizing the capability of Weather Modification Technology Operations covering various existing elements.

a. *ENDS* (Goals to be achieved)

Based on the results of the research that the conditions of the Air Defense Operations carried out so far still require support. The implementation of Air Defense Operations so far has not achieved optimal results. Therefore, the goal to be achieved is to utilize the capabilities of the 2nd Air Squadron TMC Operations in supporting Air Defense Operations.

b. *WAYS* (Actions / Ways)

In order for the Air Squadron's TMC capabilities to be utilized adequately and to optimally support Air Defense Operations, several efforts and actions need to be made. In order for the implementation of TMC Operations carried out by the 2nd Air Squadron to be utilized optimally, it is necessary to make efforts to overcome obstacles and problems that are still often found. These efforts include the fulfillment of raw materials and the addition of equipment as needed, equipping the defense equipment with weather radar. With the fulfillment of all the needs for raw materials and equipment as well as the resolution of various problems and obstacles that occur, the ability of TMC Operations can achieve

optimal conditions. Furthermore, this capability will be utilized in supporting air defense operations. As is known, one of the obstacles in flight is bad weather, which allows the aircraft to be unable to take off or land. This TMC capability will later be used to overcome bad weather conditions for friends and can create bad weather for opponents so that the opposing party cannot operate the aircraft's defense equipment.

c. *MEANS* (Instruments/Infrastructure)

Facilities and infrastructure as well as instruments are important elements or main elements in supporting a successful implementation of missions and operations. In general, infrastructure or instruments are in the form of objects or things that can support the process of implementing TMC operations so that they can achieve the desired goals. The instrument used to achieve the goal is to utilize the capability of Air Squadron 2 TMC Operations in supporting Air Defense Operations including defense equipment, equipment and raw materials needed to carry out TMC. To improve the capability of personnel, training and education are carried out related to the implementation of Weather Modification Technology Operations. With the fulfillment of facilities and infrastructure or instruments, it can have an impact on the implementation of the 2nd Air Squadron TMC operation and also have an impact on the 2nd Air Squadron's increasing capability. This also has an impact on the support provided in optimal conditions for the implementation of Air Defense Operations. By utilizing the capabilities of the 2nd Air Squadron, which are in optimal conditions, it has an impact on the smooth implementation of Air Defense Operations.

In general, it can be concluded that the strategy to increase the utilization of the Weather Modification Technology Operation capability of the 2nd Air Squadron is to identify the potential threats it faces. With the aim to be achieved, namely to overcome threats that can arise. Air Defense Operations get support through the use of Weather Modification Technology Operations capabilities owned by Air Squadron 2 through existing facilities and infrastructure and will later have an impact on the optimal conditions achieved in the implementation of Air Defense Operations (Stein, 1982).

## **5. Conclusion**

From the research results that have been described previously, it can be summarized in the following conclusions.

### **a. Potential Threats to Air Defense Operations.**

There are several potential threats to Air Defense Operations today. The potential threats include violations committed by military and civilian aircraft that have the potential to pose a threat to national air sovereignty. Threats such as unlicensed flights passing through the airspace of the Republic of Indonesia have the potential to carry out activities such as espionage or reconnaissance operations (Robbin, 1999).

### **b. Current Implementation of Air Defense Operations**

The description of the current state of the implementation of Air Defense Operations is that there is a bureaucratic system that is still difficult and takes a long time to move fighter aircraft in intercepting aircraft that commit violations, air defense is still constrained by ceremonial activities which often involve all aircraft owned by the Indonesian Air Force so that became an air defense vulnerability at that time, current air defense

operations are not optimal and not efficient because interoperability has not been able to run optimally, Kohanudnas can properly integrate the defense equipment owned by the radar units below it and integrate it with the airport SSR radar in the airspace border area, Repair and revive war equipment that is not operational due to limited or unavailability of spare parts. Possible threats that can arise against the air sovereignty of the Republic of Indonesia are all aircraft of other countries that violate the National Airspace without using Transponders in the area of National Airspace that are not covered by the PSR Radar with bad intentions, violations of airspace carried out by civil and military airlines operating under the PSR. do it intentionally or unintentionally, Pre-Emptive Strike. A military attack launched suddenly against an enemy force that poses a threat to the territorial integrity and sovereignty of the country. Before the enemy attacks, this preventive attack is very effective in destroying the will to fight for the opponent (Siagian, 2000).

c. Strategy to Increase Support for Air Defense Operations Through Utilization of Weather Modification Technology by the Air-2 Squadron

In the aspect of *ENDS* (objective): The implementation of Air Defense Operations so far has not achieved optimal results. Therefore, the goal to be achieved is to utilize the capabilities of the 2nd Air Squadron TMC Operations in supporting Air Defense Operations. On the *WAYS* (action) aspect: In order for the implementation of TMC Operations carried out by Air Squadron 2 to be utilized optimally, efforts must be made to overcome obstacles and problems that are still often found. These efforts include the fulfillment of raw materials and the addition of equipment as needed, equipping the defense equipment with weather radar. With the fulfillment of all the needs for raw materials and equipment as well as the resolution of various problems and obstacles that occur, the ability of TMC



Operations can achieve optimal conditions. Furthermore, this capability will be utilized in supporting air defense operations. In the *MEANS aspect* (Instruments/Infrastructure): The instruments used to achieve the goal, namely the utilization of the Air Squadron 2's TMC Operation capabilities in supporting Air Defense Operations, include defense equipment, equipment and raw materials needed to carry out TMC. To improve the capability of personnel, training and education related to the implementation of Weather Modification Technology Operations are carried out .

### Bibliography

- Anggiat , MS & Hadiati , S. (2001). *Empowerment Source Power Human* . Jakarta: State Administration of the Republic of Indonesia.
- Arikunto . (2006 ). *Method Study qualitative* . Jakarta: Earth characters .
- Builder, CH (1989). *"The Masks of War"*, Baltimore: The Rand Corporation 1989, The Johns Hopkins Ltd. University Press.
- Based on Script Temporary Swa Air Force TNI Doctrine Bhuwana Pakca (SBP) in 2019.
- Carl H. Builder. (1989). *" The Masks of War "*, Baltimore: The Rand Corporation 1989, The Johns Hopkins Ltd. University Press.
- Cotton, WR (1998). *Weather Modification by Cloud Seeding*. *diretrieve from* [http://rams.atmos.colostate.edu/gkss\\_node4.html#SECTION00040](http://rams.atmos.colostate.edu/gkss_node4.html#SECTION00040) accessed April 6, 2020
- Dennis, AS (1984.) Experiment on Augmentation of Rainfall From Cumulus Cloud. Weather Modification Program . Report No. 31. Appendix D.
- Kodoatie , R. J & Sjarief , R. (2006). *Management Disaster Integrated* . Jakarta: Yarsif Watampone .
- Krauss, TR (1999 ). *Personal Communication* . Maryland: University of Maryland.
- Miles, MB (2014). *Qualitative Data Analysis, A. Methods Sourcebook, Edition 3* . USA:



Sage Publications.

Moenir , HAS (2008). *Management Service Common in Indonesia* . Jakarta: Earth characters .

Nasir, A. (2011). *Methodology Health Research* . Yogyakarta : Noble medicine .

Ramli, S. (2010). *Instruction Practical Management Fire (Fire. Management)*. Jakarta: Dian Rakyat.

Robbin, S. (1999). *Behavior Organization ( Translated by Diana Angelica, et al )*. Jakarta: Salemba Four

Siagian , PS (2000). *Management strategic* . Jakarta:PT. Bumi characters .

Stein, JM (1982). *Random House College Dictionary, Revised ed. 1982*. New York: Random House.

Sugiyono . (2018). *Method Study Quantitative , Qualitative , and R&D*. Bandung: Alphabeta .